



**GENERAL ATOMICS
AERONAUTICAL**

Honeywell



Joint Detect and Avoid Flight Testing



Heather Maliska – Deputy Project Manager for Armstrong Flight Research Center

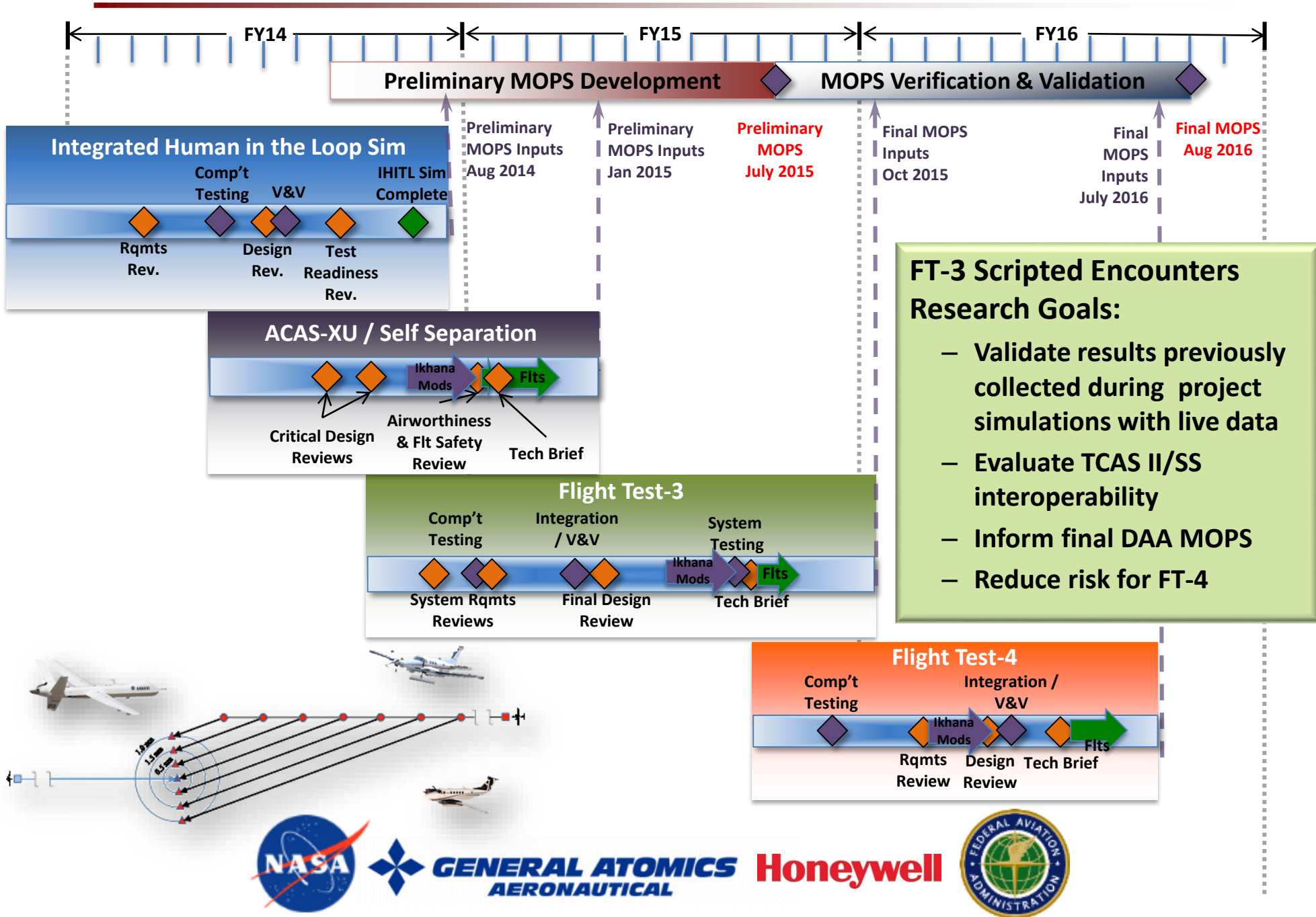
Ramon Estrada – Due Regard Radar Program Manager, Mission Systems, General Atomics Aeronautical Systems Inc.

Eric Euteneuer – Need Title

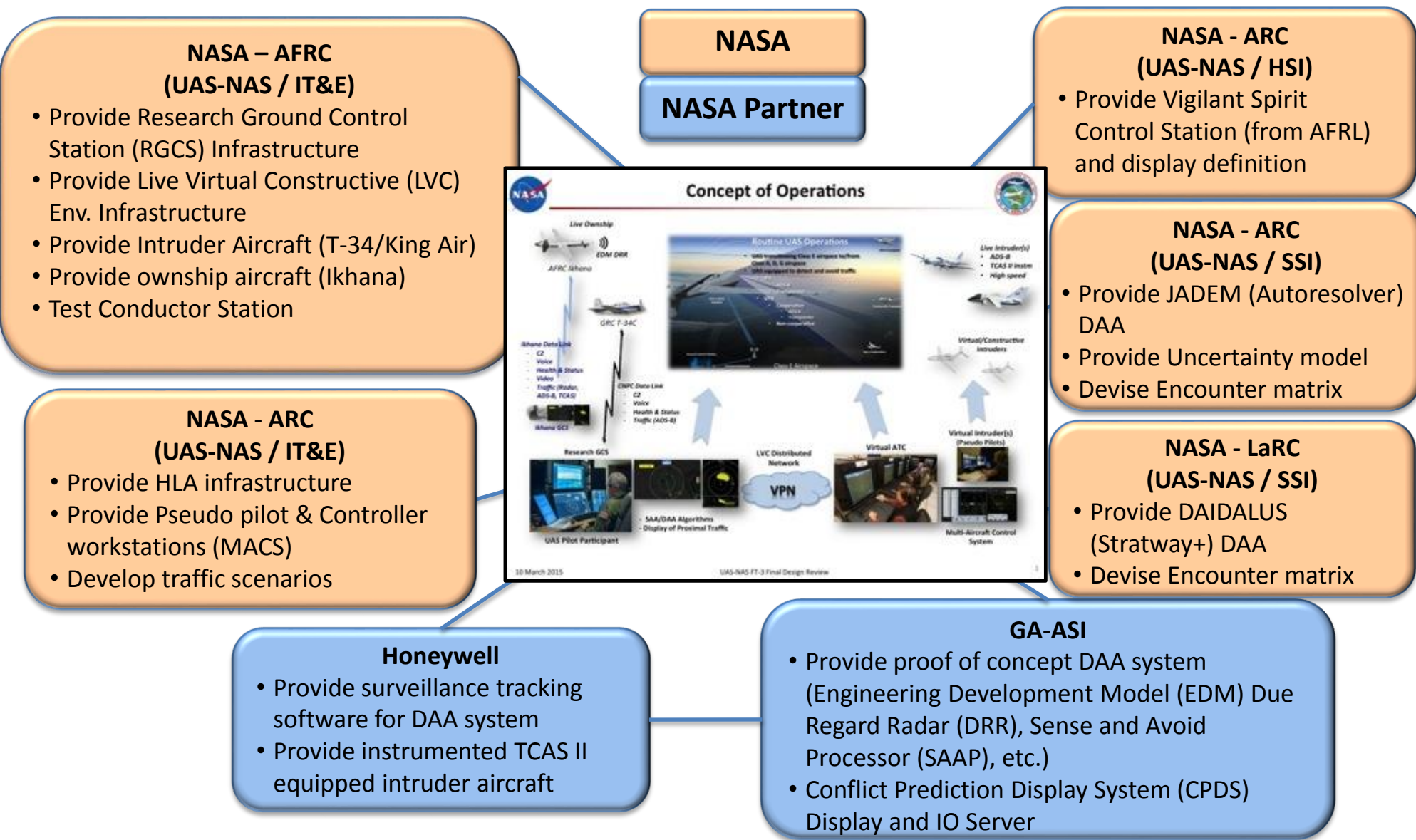
Chester Gong – Need Title

Keith Arthur - Separation Assurance/Sense and Avoid Interoperability Co-Project Engineer

UAS-NAS Test Flow



FT3 Integration Roles & Responsibilities Summary



Flight Test 3 Scripted Encounters Requirements

- Live Ownship (OS)

- Low Speed OS – DRR, ADS-B, and TCAS Sensors, Sensor Fusion

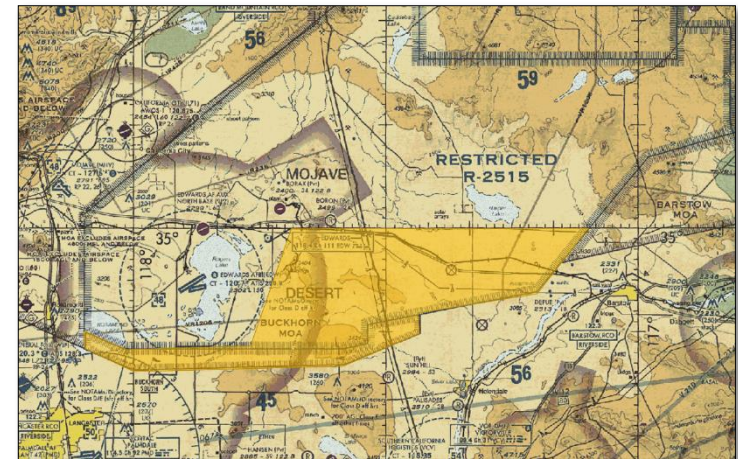
- Ikhana

- EDM DRR ($\pm 110^\circ$ az and $\pm 15^\circ$ elev) non-coop sensor
- ADS-B coop sensor
- TCAS II v7.1 coop sensor
- HON STM (sensor fusion/tracker)



- Live Intruder(s)

- ADS-B equipped
- TCAS II Instrumentation for interoperability test
- High speed (250 KGS capable)
- Multiple – 2



Work Area:

EAFB R-2515 and Buckhorn MOA
Four Corners, Mercury Spin



Honeywell King Air, N3GC



T-34, NASA 865



F-18, NASA 850



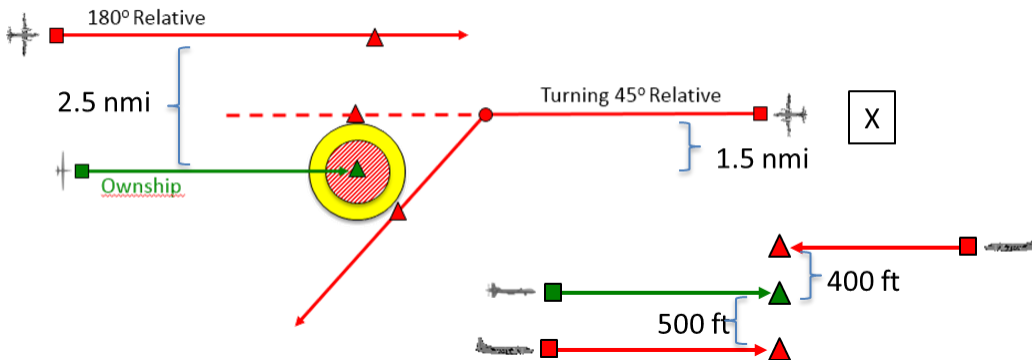
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Flight Test 3 Encounters Summary

- Flight Test Series 3 (June 17 – July 24, 2015)
 - Ikhana vs. manned intruder(s)
 - 11 flights completed
 - Over 200 air to air encounters
 - DAA maneuver guidance and alerting logic checks
 - Auto TCAS II maneuvers
 - EDM radar performance near scan volume limits
 - EDM radar low altitude performance tests
 - Higher closure rate encounters with FA-18
 - Stressing multi-intruder encounters



Configuration & Nomenclature	
[Series] [Minimum Altitude] [Offset] [Vertical Profile] [Encounter Angle]	
<ul style="list-style-type: none"> Series <ul style="list-style-type: none"> L Low Speed H High Speed M Multiship Minimum Altitude/Offset <ul style="list-style-type: none"> 1 1000 ft 2 2000 ft / 700 ft 3 3000 ft 4 4000 ft 5 5000 ft 6 6000 ft / 700 ft 7 7000 ft / 1500 ft 8 8500 ft 9 9000 ft Vertical Profile (Ownship / Intruder) <ul style="list-style-type: none"> 1 H-Level / Level 2 H-Level / H-Level 3 H-Level / Climb 4 H-Level / Descent 5 Climb / Level 6 Descent / Level 7 Climb / Descent 8 Descent / Climb 9 H-Level / H-Level 	<ul style="list-style-type: none"> Encounter Angle <ul style="list-style-type: none"> A 0 degrees B 20 degrees C 35 degrees D 50 degrees E 60 degrees F 70 degrees G 80 degrees H 90 degrees J 45 degrees K 90 degrees L 135 degrees M Turning 5 degrees N Turning 90 degrees P Zig-Zag Q 0 / 0 R 0 / 45 S 0 / 90 T 0 / 135 U 0 / 20 V 5 / 90 W 90 / 135 X Turning 5 degrees / 180 degrees



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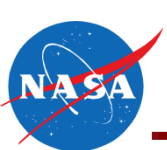
QUESTIONS???



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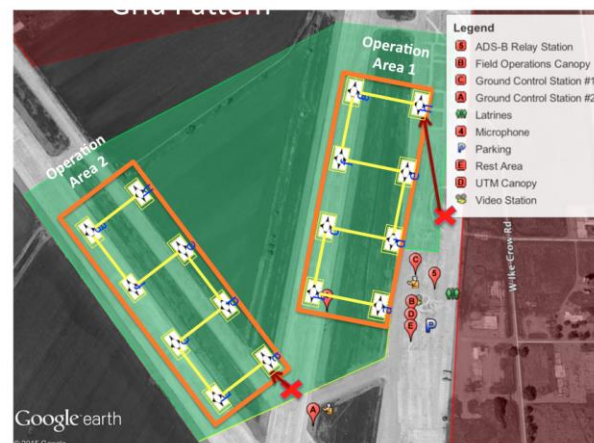


FAA UAS Test Site Contracts

- NASA and the FAA UAS Test Sites have entered into an Indefinite Delivery Indefinite Quantity (IDIQ) contract to perform relevant UAS Testing
- NASA will leverage the contract to bring industry and the Test Sites together to partner on technology development specific to NASA's technical goals
- 2 Tasks have been awarded, each to all 6 Test Sites
 - Task 1 UTM Integration: Test Sites to integrate build 1 of UTM and fly 4 aircraft simultaneously
 - Task 2 Prototype LVC-DE Connection: Test Sites to Leverage LVC-DE ICD and demonstrate prototype connection leveraging a P2 MOPS capability



TASK 1: NASA UTM Integration and Build 1 Demos



Task 2: UAS-NAS LVC-DE Build including FAA UAS Test Sites

